Terrestrial Amphibians and Mollusks:

Evaluation of an Integrated Survey Method

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ABSTRACT.—We developed and evaluated an integrated sampling method to determine presence of terrestrial amphibian and mollusk species. Our goal was to be more efficient at locating both taxa during the same field surveys. Our protocol employed standardized Time (TCS)- and Area-Constrained searches (ACS) of forest floor habitat, and collection of "hand grabs" of leaf litter. We paid special attention to areas with talus substrates, which are important microhabitat for many mollusks and salamanders in southwestern Oregon. The new protocol was successful in detecting salamanders but we located no mollusks identified as Survey and Manage Species (S&M; part of the Northwest Forest Plan), However, S&M mollusks are rare in the region and most are also small-sized, which makes detection particularly difficult. Still, the integrated protocol or possible modifications show promise to provide information on assemblages and associated habitat use of mollusks and salamanders inhabiting talus substrates. We suggest that future surveys differentiate between habitat types: (1) talus (sample with timed or area searches); (2) leaf litter (use hand grab samples); and (3) aquatic/mesic (habitat that require other techniques). Further, it may be worthwhile for inventories to concentrate on mollusk surveys and record any herpetofauna captures as well as to have both surveys use a common habitat classification (i.e., one characterization of vegetation and physical features in a plot that serve multiple specialized searches of animals).

INTRODUCTION

There is a need to develop reliable sampling methods that integrate surveys of various faunal and floral groups (Smith et al. 1999). Current standards and guidelines under the Northwest Forest Plan require that Federal land managers conduct surveys for various Survey and Manage Species (S&M) prior to any ground-disturbing activities, including certain species of terrestrial mollusks and salamanders. These guidelines are available at:

http://www.or.blm.gov/surveyandmanage/SP/Mollusks/tcover.htm

However, limited funding and narrow timeframes to survey have made it difficult to conduct effective surveys for many S&M salamanders and mollusks.

Although information is lacking on many of the S&M species, some may co-occur in similar environments (e.g., downed wood, talus substrate, seeps, riparian areas). In our prior surveys throughout the Pacific Northwest (see Bury et al. 1991, Corn and Bury 1991, Bury and Pearl 1999), we noted that terrestrial mollusk species are commonly encountered during amphibian surveys. This suggests that an integrated survey approach may be possible, but an effective protocol remains to be developed for sampling both groups at the same time. Further, little is known about the habitat requirements of many S&M mollusks, particularly those species that may occur in talus.

The goal of this project was to test the applicability of an integrated survey method to sample both S&M terrestrial amphibian and mollusks. Specifically, our objectives were to: (1) explore the development of a single sampling protocol for designated S&M species in both taxonomic groups; (2) test the effectiveness of this protocol across known S&M salamander locations, (3) compare mollusk species diversity across these sites; and (4) evaluate the reliability of an integrated sampling protocol. Background on this project is available online at:

http://webdata.fsl.orst.edu/fresc/administrative/detail.php?projectID=26&cat=Wildlife

STUDY AREA AND METHODS

We conducted field work at 3 study sites in mature and old-growth Douglas-fir (*Pseudotsuga menziesii*) forests in southwestern Oregon: Couger Ridge, Picket Creek and Indian Mary on the Rogue - Siskiyou National Forest. All were known sites for terrestrial salamanders such as the Del Norte salamander, *Plethodon elongatus* (D. Clayton, pers. comm.; our field surveys). We searched these sites for both amphibians and mollusks during optimal weather conditions (e.g., wet, warm days) in fall 1998. We employed standardized protocols to sample amphibians following methods of Corn and Bury (1990, 1991) and guidelines for S&M terrestrial amphibians (Olson 1999). Mollusks encountered during these surveys were identified (usually to generic level for those not on S&M lists), measured, retained until end of survey, and released at the capture site. We retained some individuals for later identification and these were preserved as voucher specimens.

We compared species presence/not found and relative abundance (captures/hr). Also, we attempted to compare species-level capture efficiency and detectability among different habitats. The information is summarized in a reliability matrix (species/habitat/forest) to examine the overall feasibility of the integrated method. We sampled 3 plots per site (N = 9 total plots). We used time-constrained (TCS) and area-constrained searches (ACS) to determine presence and relative abundance of mollusks. We spent 1.5 person-hrs at each plot (= 4.5 person hrs/site). ACS was in a 10-m diameter circular plot (Fig. 1). TCS had no set size, but was limited by amount of time available and generally was in an area ca. 25-m in diameter.

Also, we took hand grab samples (each approximately 0.5 liter) within each ACS plot. We randomly collected 4 hand grabs (1 per quadrat; Fig. 1) within each ACS plot. Total was 12 hand grabs per site (3 plots X 4 grabs). These were a grab of forest-floor litter that we placed in a brown paper lunch bag (approx. 1 liter). In the laboratory, we sorted litter and separated out mollusks for identification and measurement.

RESULTS

We found Del Norte salamanders at all 3 sites. We captured 6 genera (N =189 individuals) of mollusks, but none were S&M species (see Tables 1 and 2). One site (Cougar Ridge) had 6 genera present, followed by Picket Creek and Indian Mary with 4 genera each. The two most commonly encounted mollusks were *Haplotrema* spp. and *Monadenia* spp. Both were encountered on all sties.

TCS captured more mollusks (N = 59) than area-constrained surveys (N = 26). We took most (N = 104) in hand-grab samples. TCS provided a mean capture rate of 4.4 mollusks per person-hr whereas each ACS (about 0.5 hr each) had 5.7. Hand grabs were rapid in the field and only took a few minutes each, but they required many hours to sort through the leaf litter once in the laboratory.

DISCUSSION AND MANAGEMENT IMPLICATIONS

We found 6 genera of common mollusks but none were the S&M species of highest management concern. All three techniques we used were somewhat effective. Although hand grabs provided the highest number of individuals, about half of those mollusks found were small-sized individuals and these proved difficult to identify accurately as young mollusks have fewer diagnostic characteristics than larger-sized individuals. TCS provided high numbers and the greatest species richness compared to the other two methods.

ACS combined with hand grabs may provide the best yield and presence of mollusks, especially with improved methods to identify smaller individuals. TCS and ACS tended to miss smaller-sized individuals based on collected material. Litter samples had many small-sized individuals of mollusks.

Leaf litter samples (from hand grabs) indicated that many mollusks occur in this common microhabitat. We suggest further study of the use of leaf litter samples in field surveys (e.g., taking larger amounts of litter to increase the sample sizes of mollusks). This may reveal more S&M species.

Lack of S&M mollusks in our surveys may not be unusual because we covered a relatively small amount of area. Further, these mollusks are naturally rare or remain elusive. The hand grab technique may prove effective for capture of mollusks. However, our experience indicates that hand grab samples alone would be inadequate for reliable detection of salamanders, which are species that tend to aggregate under cover objects such as downed wood and cobble (Bury 1994).

To sample both S&M groups of taxa, we suggest that a portion of field surveys focus on talus and on any cover objects (e.g., large woody debris). Each microhabitat houses several S&M mollusks and S&M salamanders such as the Siskiyou Mountain salamander (*Plethodon stormi*). Basically, we suggest that there be a habitat classification undertaken prior to surveys to differentiate available types: talus, deep leaf litter, and aquatic/mesic. Each may merit its own collecting regime because presence of animal taxa vary greatly between them.

Our preliminary surveys did not support the hypothesis that one can combine effectively both mollusk and salamander surveys into one integrated sampling protocol. Traditionally, field investigators tend to focus on one group or the other, and this practice of specialists may need to continue to adequately locate these taxa. In part, separate searches are needed because of greatly different body sizes in the two target taxa: relatively small-sized mollusks compared to larger-sized salamanders.

Future work might attempt the opposite of what we did by conducting S&M Mollusk Surveys (following standard protocols) and tabulating what amphibians are found. There are relatively few species of salamanders in the region and most can be clearly identified with training (although there are a few cryptic forms, especially in the juvenile stages). Thus, mollusk surveys could provide inventory level (presence/not found) for S&M salamander species, but not vice-versa (i.e., salamander surveys do not reveal S&M mollusk species). Also, field crews quickly develop a search image for the target organisms and this specialization may need to continue (e.g., most surveys for salamanders are conducted in heavy forest with poor light conditions as well as covering relatively large tracts of terrain).

For now, it appears that terrestrial mollusks and salamanders each needs its separate sampling protocol, but there remain areas of overlap or coordination. Both groups could be sampled on the same plot so habitat could be recorded once and then used for both taxonomic groups.

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Table 1 - Captures of terrestrial mollusks in Area-Constrained Searches (10-m diameter plots) from three sites in southern Oregon.

				SNAILS				*SLUGS*	Unknown	TOTAL	TOTAL
SITE	NAME	PLOT #	Quadrat	*Haplotrema*	*Nearctula*	*Vespericola*	*Monadenia*	*Prophysaon*	Juveniles	N	SPECIES
98001	Cougar Ridge	ACS – 1	I	1	--	1	--	- -	---	2	2
			II	--	--	--	1	--	1	2	1
			III	2	--	--	--	--	--	2	1
			IV	--	--	--	--	--	--	0	0
			total	3	0	1	1	0	1	**6**	**3**
98002		ACS - 2	I	--	--	--	--	--	--	0	0
			II	1	--	--	1	--	2	4	2
			III	--	--	--	--	--	1	1	0
			IV	2	--	--	--	--	--	2	1
			total	3	0	0	1	0	3	**7**	**2**
98003		ACS - 3	I	--	--	--	1	--	--	1	1
			II	1	--	--	--	1	1	3	2
			IV	--	--	--	1	--	--	1	1
			total	2	0	0	3	1	2	**8**	**3**
98004	Pickett	ACS - 1	I	--	--	--	--	--	6	6	1
			III	--	--	--	--	--	2	2	1
			IV	--	--	--	--	--	2	2	0
			total	0	0	0	0	4	12	**16**	**1**
98005		ACS - 2	I	--	--	--	--	--	--	0	0
			II	1	1	--	--	--	3	5	2
			III	--	--	--	--	--	--	0	0
			IV	--	--	--	--	--	--	0	0
			total	1	1	0	0	0	3	**5**	**2**
98006		ACS - 3	I	--	--	--	--	--	1	1	0
			II	--	--	--	--	--	--	--	0
			III	--	--	--	--	--	--	--	0
			IV	1	--	--	--	--	--	1	1
			total	1	0	0	0	0	1	**2**	**1**

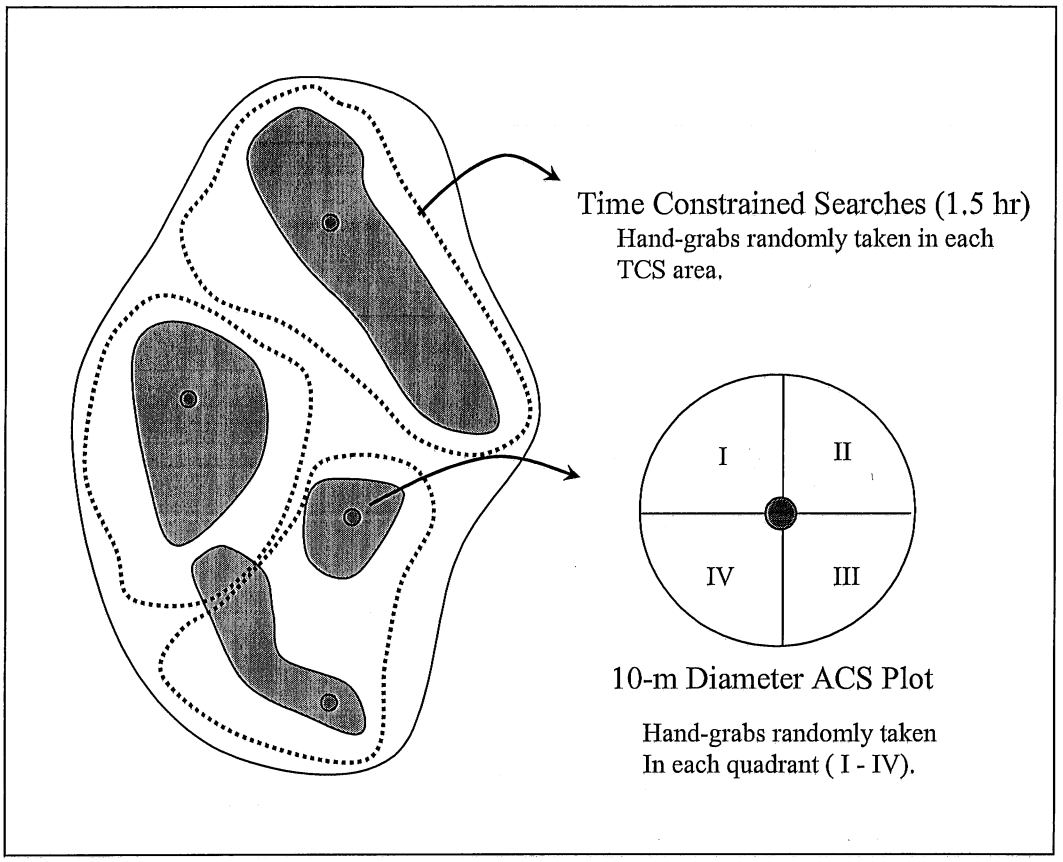
Table 1, continued

SITE	NAME	PLOT #	Quadrat	*SNAILS* *Haplotrema*	*Nearctula*	*Vespericola*	*Monadenia*	*SLUGS* *Prophysaon*	Unknown Juveniles	TOTAL N	TOTAL SPECIES
98007	Indian Mary	ACS - 1	I	1	--	1	--	1	5	8	2
			II	--	--	--	1	--	2	3	1
			III	2	--	--	--	--	8	10	1
			IV	--	--	--	--	--	--	0	0
				3		1	1	1	15	**21**	**3**
98008		ACS - 2	I	--	--	--	--	--	--	0	0
			II	--	6	2	--	2	2	12	3
			III	--	1	--	--	--	2	3	1
			IV	--	1	--	--	--	5	6	1
			total	0	8	2	0	2	9	**21**	**3**
98009		ACS - 3	I	--	--	--	--	--	--	0	0
			II	--	1	5	--	--	5	11	2
			III	--	--	--	--	--	--	0	0
			IV	3	--	2	--	--	2	7	2
			total	3	1	7	0	0	7	**18**	**3**

Table 2. Captures in Time-Constrained Searches (2-hr) and Area-Constrained Searches (10-m diameter plots).

				SNAILS				*SLUGS*	Unknown	TOTAL	TOTAL
SITE	NAME	SEARCH	Number	*Haplotrema*	*Vespericola*	*Monadenia*	*Helminthoglypta*	*Prophysaon*	Juveniles	INDIVIDUALS	SPECIES
98001	Cougar Ridge	TCS	1	8	2	4	2	1	1	18	5
		ACS	1	4	--	1	--	1	--	6	3
98002		TCS	2	4	2	5	1	--	--	12	4
		ACS	2	--	--	--	--	--	--	0	0
98003		TCS	3	4	2	1	--	--	--	7	3
		ACS	3	1	1	--	--	--	--	2	2
		Totals	TCS	16	6	10	3	1	1	**37**	**5**
			ACS	5	1	1	0	1	0	**8**	**4**
98004	Pickett Creek	TCS	1	3	--	2	--	--	--	5	2
		ACS	1	3	--	1	--	--	--	4	
98005		TCS	2	1	--	1	--	--	--	2	2
		ACS	2	1	1	1	--	--	--	3	
98006		TCS	3	1	--	2	--	--	--	3	2
		ACS	3	1	--	--	--	--	--	1	
		Totals	TCS	5	0	5	0	0	0	**10**	**2**
			ACS	5	1	2	0	0	0	**8**	**3**
98007	Indian Mary	TCS	1	2	2	3	--	--	2	9	3
		ACS	1	2	3	--	--	--	--	5	2
98008		TCS	2	--	--	--	--	--	--	0	0
		ACS	2	1	2	--	--	--	--	3	2
98009		TCS	3	2	--	1	--	--	--	3	2
		ACS	3	2	--	--	--	--	--	2	1
		Totals	**TCS**	4	2	4	0	0	2	**12**	**3**
			ACS	5	5	0	0	0	0	**10**	**2**

Figure 1. Schematic of ACS (plot) and TCS sampling design for Intergrated Herpetofauna/Mollusk sampling protocol. Spring 1998.



Appendix. List of terrestrial Oregon mollusks. ● = present at sampled sites in SW Oregon.

PRESENCE	GENERA	COMMON NAME
	Allogona	forest snail
	Planogyra	flat whorl
	Carychium	western thorn
●	Monadenia	side band
●	Helminthoglypta	shoulderband
	Ancotrema	lancetooth
	Columella	column
	Cryptomastix	oregonian
	Trilobopsis	chaparral
	Oreohelix	mountain snail
	Euconulus	brown hive
●	Haplotrema	lancetooth2
	Megomphix	megomphix
	Pristoloma	tightcoil
	Ogaridiscus	S tightcoil
	Microphysula	spruce snail
	Striatura	NW striate
	Vertigo	vertigo
●	Nearetula	threaded vertigo
	Pupilla	crestless column
	Vallonia	vallonia
	Nesovitrea	glass
	Zonitoides	gloss
	Discus	disc
	Helicodiscus	salmon coil
	Punctum	conical spot
	Paralaoma	striate spot
	Vitrina	glass snail
●	Vespericola	hesperian
	Hochbergellus	Sister hesperian
	Polygyrella	humped coin
	Succinea	ambersnail
	Prophysaon	tail-dropper